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South Carolina Institute of Archaeology and Anthropology--University of South Carolina

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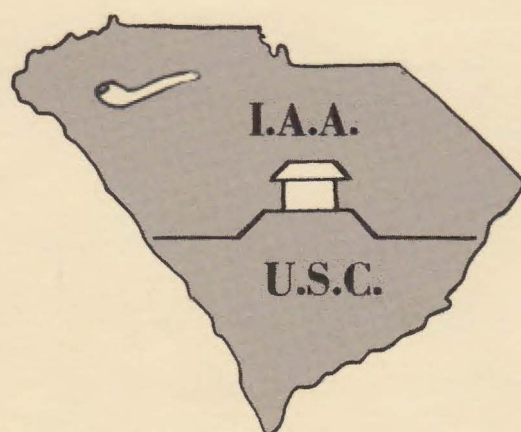
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THE INSTITUTE OF ARCHEOLOGY AND ANTHROPOLOGY

NOTEBOOK

THE UNIVERSITY OF SOUTH CAROLINA • COLUMBIA



A monthly report of news and activities of mutual interest to the individuals and organizations within the framework of the Institute of Archeology and Anthropology at the University of South Carolina and for the information of friends and associates of the Institute.

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EDITOR'S PAGE

This issue of the Notebook is devoted to an article setting forth the research philosophy of the Institute as it pertains to contract or emergency archeology in general and to highway archeology in particular. The Institute is in the business of contract archeology as are most other archeological research facilities and organizations throughout the nation. We are into contract archeology and we are maintaining a commitment also to "leisurely" or "non-emergency" archeology. Our basic concept of statewide research planning falls into the latter category as do some of our specific projects. Most of the specific projects, though, are done within a contract framework that generates data to be fed into the specific sections of the statewide research plan. In short all of the research done by the Institute, contract or non-contract, small projects or large projects, become a part of a pre-conceived plan of research. Even a small contract project where no archeological remains are found provides specific data for the statewide plan.

Mr. Goodyear's article sets forth some of the basic concepts of how this is done. It pertains especially to the Highway Archeology Program of the Institute. It emphasizes one major point that is basic to the Institute's archeological research. That is that there are no differences between contract and non-contract archeology; that well-done archeological research, with a well-designed purpose, must be the goal in either context.

The Institute is pleased with the Highway Archeology Program that has developed with the South Carolina Highway Department. Some four years ago we began discussions with the Department but the mechanics of funding were slow to develop. A year ago the first contract was negotiated between the Department and the Institute through the good offices of Mr. Paul Cobb, Chief Highway Engineer, and Mr. Robert Ferrell, Environmental Program Coordinator for the Highway Department, and with the concurrence of Mr. Silas J. Pearman, Highway Commissioner. Under this contract the Department funded a position of archeologist and some research funds on which to operate. Mr. Goodyear was hired for that position. This was designed as a continuing program, renewable each year. We have just completed the contract for the second year of highway archeology with provision for additional staff assistants and additional research capability. We look forward to many years of continuing research under this program; research that will be beneficial to the Highway Department as well as to the archeological research plan of South Carolina.

The South Carolina Highway Department has, in the past couple of decades, developed an outstanding network of roads throughout the State. Many of the major roads were completed before archeology became a consideration and many sites were unquestionably destroyed. For example, one section of double-lane highway contains fill from a borrow pit that had been a large village site. That section of highway is now loaded with meaningless potsherds and other artifacts that could have told a tremendous story of the prehistory of South Carolina had there been an archeological program in the early 1960's.

Today that threat to our archeological heritage is removed. The remaining sections of Interstates, Freeways, Throughways, Beltlines, and

other highways that are to be built can be built with consideration for the archeological resources. Not only these main new highways, but the repairs to and widening of existing highways and small roads are being considered in relation to archeological and historical values. Every highway project that is anticipated, from the change of a stop-light in a town to the largest new Interstate is reviewed by the Highway Archeologist.

This is a program of conservation. The Highway Department funds are for survey and study of impact on the archeological and historical resources. Funds for excavation of a site, when required, are to be contracted for separately. If feasible, this is avoided and highway rights-of-way are changed. Any site that can be preserved for the future is preserved. If it cannot be, it will be excavated with the fullest use of the best methods and techniques available to us. It is the purpose of Mr. Goodyear's article, here, to explain how and why this is being done.

Our sincere appreciation goes to the South Carolina Highway Department for its continuing support and cooperation in this program and to the South Carolina Department of Archives and History for its support and cooperation. As with so many other facets of archeology in South Carolina, the Department of Archives and History provides strong support for this program especially in the historical aspects of the work. The director of that Department, Mr. Charles E. Lee, is the State Historic Preservation Officer and he, too, reviews all of these projects. Thanks to all of these people our Highway Archeology Program is working.

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A GENERAL RESEARCH DESIGN FOR HIGHWAY ARCHEOLOGY IN SOUTH CAROLINA

by Albert C. Goodyear

INTRODUCTION

Perhaps no other area of archeology has remained so underdeveloped in terms of taking advantage of modern scientific procedures as that of highway salvage. In this latter connection, highway archeology has shared with salvage archeology in general a somewhat less than respected reputation as imposed by areas of archeology involved in "pure research". There are several reasons that can be adduced for such distinctions, many of which are obviously warranted. In recent years agencies and institutions involved in contract archeological projects have grown increasingly dissatisfied with both strategies and results. There has been an increasing awareness that salvage archeology has often fallen short of its anthropological goals. In recent years, in an effort at self criticism and improvement, contract archeology has been attempting to upgrade the method and theory applied in its operations and to view the archeological data base as a finite non-renewable resource which must be managed in a variety of ways.

Many contract operations are conducted in a highly ad hoc fashion with the primary research emphasis placed upon the excavation of a few "significant" sites. The definition of significance often is not explicitly spelled out and fluctuates from area to area as well as by investigator. In many cases contract funding is predicated -- both in size and allocation -- on the existence of a few "significant" sites resulting in a biased and uneven treatment of the archeological record. Owing to limitations in manpower and funding, narrow approaches have been taken and limited goals have been set for impacted sites and as a result contract projects have often yielded limited information. Funding has often been limited or non-existent for many critical aspects of thorough investigation. Many of the available resources for research were devoted to large, deeply stratified sites since such sites often contained answers to key questions of culture history.

The foregoing comments have not been made merely to set up a foil for modern contract archeology, an institution that still suffers from many of the same inadequacies. It would also be unfair not to point out the contributions made by prior salvage projects toward substantive and methodological knowledge, particularly in the numerous river basin surveys. Brew (1962) discusses the development of salvage archeology as an organized institution for that period and its contributions. The Navajo Reservoir Project (Dittert, Hester, and Eddy 1961) also can be cited as an example of problem-oriented interdisciplinary archeology in a salvage context.

In spite of meaningful gains produced from a contract framework, certain limitations remain, many of which are conceptual in nature. Recent papers by archeologists (King 1971; Gumerman 1973; Watson 1973; Raab 1973; Schiffer and House n.d.; Lipe 1974; Canouts 1972; and South 1974) have pointed out the inadequacies of salvage archeology and offered positive criticism that

will enable contract archeology to make increasingly greater contributions to anthropological knowledge. However, as the same papers would point out, old habits are hard to break. We need to explicitly and rigorously examine our goals, strategies and basic organizations in order to involve ourselves in the mainstream of productive social science research. The primary or ultimate goal of all archeological research, regardless of source of funding or impetus, is the elucidation and explanation of cultural processes.

New Directions for Contract Archeology

Spurred on primarily by the revolutions in method and theory which were produced in the 1960's and continuing to the present, contract archeologists have begun to seriously re-examine their goals and orientations. Noteworthy is the article by King (1974). King has properly brought into perspective the basic conflict between deductively and inductively framed approaches of doing archeology and how the theoretical and methodological requirements of each are often mutually at odds. Central to his criticism is the lack of explicit theory and hypothesis testing in traditional inductive approaches. The problems of providing services to non-archeological agencies were also outlined in relation to operating in a truly deductive framework. King's (1971) paper properly criticized the present condition of modern contract archeology including points which ranged from its implicit problem orientation to inductive strategies of research, one of which cannot be separated from the other.

In a recent paper on the same subject, Gumerman (1973) has reviewed the condition of contract archeology re-affirming many of the observations made by King (1971). In essence, the recommendation by both King and Gumerman is for contract archeology to move from primarily an inductive, implicitly problem-oriented approach to that of a theory-constructing and theory-testing enterprise. Gumerman's (1973) paper is of extreme interest to the institution doing highway archeology since he points out several situations where even small-scale, narrow right-of-way, contract projects can make contributions to archeological theory. The observations of Gumerman in this regard will be considered shortly with respect to the South Carolina Highway Archeology Program.

Schiffer (n.d.a.) has also made a thorough review of problems and shortcomings in current contract archeology and has provided an empirical demonstration of the application of multi-level research design within a specific region, the Cache River Basin of northeast Arkansas (Schiffer and House n.d.). The Cache River Archeological Project should provide a useful model for structuring contract operations through the use of models and hypotheses formulated, to a large extent, prior to mitigation and the use of multi-stage strategies to achieve their testing.

Owing to the criticisms and exhortations of several archeological theorists of the 1960's and 1970's (Binford 1962, 1964, 1965, 1968, 1971, 1971a, 1972b; South 1972, 1974; Watson, Leblanc and Redman 1971; Redman 1973; Schiffer 1972, n.d.a.), archeology has begun to revamp its theoretical

and methodological base and to consider more seriously its role as a theory-constructing social science. It is inevitable that this same critiquing process should permeate contract archeology. There is a certain irony in the belated acceptance by contract archeology of an explicitly scientific approach. Although in a financial sense contract archeologists are in an extremely advantageous position to perform studies of culture process and explanation, their conceptual and organizational frameworks keep them at a disadvantage. This disadvantage is so great that no infusions of money regardless of sum will span the disparity between ultimate goals and actual practice.

With the advent of the National Environmental Policy Act and the recent passage of the Archeological Conservation Act (Public Law 93-291), now, as never before, professional archeology has potential research funds commensurate with the broad scope of questions archeologists have been fond of asking throughout the decades. North American archeologists have come to realize that single-site analysis or orientation will not provide the necessary regional scope to permit an understanding of the total adaptive poses undertaken by all societies in their lifeways (Binford 1964; Streuver 1968, 1971; Streuver and Brown 1973). An expansion in research organizations and strategies is required to effectively investigate such large-scale problems and consequently there is a concomitant increase in research costs. Due to decreases in N.S.F. monies and cut-backs in financial assistance to colleges and universities, frequently the primary practitioners of explicitly problem-oriented studies, contract archeology will and already has become the largest sector of North American archeological research. Contract archeology is enjoying a period of activity that will eclipse, if it has not already done so, the large-scale projects of the 1930's. In this regard it is important that archeology has undergone and is continuing to undergo conceptual and methodological housecleaning exercises and that contract archeologists along with their colleagues meet the ensuing challenge with creative and operable research designs.

With this boom in research opportunities must come certain obligations and responsibilities. Efficient spending of archeological monies must be foremost in our minds; what Schiffer and House (n.d.) refer to as the maximization of the archeological dollar in terms of the production of archeological information. Research efficiency must be measured in terms of the diversity and quality of information gained, which again, is not perfectly correlated with volumes of archeological remains or earth moved. During this period of professional growth and expansion, contract archeologists have a growing responsibility to increase the overall scientific relevance of their inquiry not only to the profession, but to other scientific disciplines and to the public.

The general conditions that have accompanied salvage archeology have been offered as reasons for not doing explicitly problem-oriented research. Among these are insufficient leadtime which prevented adequate strategy making, poor or inadequate funding for complete and ancillary studies, minimal to nonexistent funds for report writing time and for the dissemination of reports and publications, and the general problem of having to

conduct research within spatial perimeters dictated by the needs of an impacting agency. All of these have been cited as prohibitive constraints preventing explicitly problem-oriented research in the salvage context. There is no doubt that under such circumstances a deductively structured approach would be severely hampered in terms of scope and specificity.

As inter-agency communications have been improved whereby the research needs of pre-fieldwork designs are outlined and are articulated to funding agencies; as badly needed legislation has been passed providing larger and more comprehensive budgets, these traditional constraints have been greatly ameliorated. As impact areas approaching entire environmental regions such as river valleys, floodplains, and mountain sides have become commonplace, contract archeologists have been presented with sections of landscape that are relevant to regional approaches (Struever 1968, 1971; Canouts et. al. 1972; Raab 1974; Schiffer and House n.d.; Goodyear 1975). As the time period between project notification and commencement of fieldwork increases so should the quality of a priori written research designs.

In short, most of the logistical impasses historically pointed out as reasons for not doing problem-oriented archeology have been, or currently are being, removed. What still remains are outmoded and inadequate research concepts and methods which only the archeologist can remove. At this point in our development there is little substantive reason why in practical terms contract archeology cannot join the mainstream of productive scientific research occupied to date primarily by academic archeology. If we do not we run the risk of being defined as irrelevant or peripheral not only by our own colleagues but by contracting agencies as well. It is hoped that in the near future it will be difficult to separate the research results of archeological projects performed on the basis of contracts from those funded from other sources. As King (1971) and Lipe (1974) have so cogently described it, all archeological investigations within the United States could be defined as salvage archeology given the pattern and growth rate of our own society's settlement pattern. Recognizing this trend, the maintaining of two separate and unequally efficient research strategies for the non-renewable archeological resources appears even more dangerous and wasteful.

The Need for Research Design

It is argued here that one of the chief weaknesses in contemporary contract archeology relates to the weak to non-existent notion of research design. The utilization of explicit research design in normal scientific activity is commonplace. Within archeology Binford (1964) was an early proponent of explicit theory-using designs and since that time several papers have been published exploring the relationships among theory, methods and data (Struever 1968; Redman 1973a, 1973b; Watson, Leblanc and Redman 1972; and Hill 1972). There has been a great deal of lip service paid to using research design in archeology, but in many cases the design can be seen to be no more than a re-enactment of what has been traditionally done. A research design does not consist solely of a budget for operations or a projection of man-days and equipment costs necessary to dig sites. It

is true that a well-constructed research design will make careful provisions for the tactical or logistical operations of investigation. But the sine qua non of a research design must be the questions, problems or hypotheses which are being formulated and tested, which can be linked to methods and techniques adequate to their evaluation. The testing of previously formulated models and hypotheses as well as the generation of new models should be the overriding goal of any archeological endeavor. As an explicitly scientific discipline all decisions, regardless of how mundane the data or problem may seem, should be made in light of their service to theoretical goals. This implies that the data units we choose to collect or observe before, during, and after fieldwork should ultimately be capable of being related to problems.

Perhaps a more familiar term than research design is problem-oriented research. Historically, there has been a feeling in salvage archeology that contract investigators cannot afford the luxury of a true problem-oriented approach since by doing so an overly constrained and drastically limited research effort will prevail. There are several reasons why this is patently untrue.

First of all, as has been previously pointed out on several occasions, several implicit problems are present in any form of archeological research. There has been the reply in traditional salvage that one does not want to bias the data by having preconceived notions about its nature and distribution. There are biases in any form of scientific research which is all the more reason to make them explicit and allow for their evaluation. To have a bias or series of biases simply means we cannot comprehend or accommodate the totality of the physical universe and accordingly, we must be selective in what we choose for study. An explicit written research design helps publicly monitor and control the biases or orientation of our research. The use of a written research design, therefore, allows both the investigator and his colleagues to evaluate the progress and efficiency of his research and permits an easier assessment of success or failure.

By making goals and strategies explicit there is an integration of theory, method and data. It is important to be aware of these goals and their data requirements, prior to actually collecting data, to better insure that testing can take place. This is not to deny that some of our best hypotheses are derived after completion of fieldwork. But, as is often the case, it is impossible to test those hypotheses adequately since data that inspired them may not be adequate to their continued testing. While it is at least possible to conduct research around certain problems without written designs, as the problems become more complex and the data requirements more comprehensive, a certain inefficiency prevails which detracts from the overall effort. It becomes intellectually impossible to adequately integrate the crucial, conceptual, and empirical components of successfully conducted research.

It has also been said that a strict problem-oriented approach does not permit collection of the broad range of archeological data which is appropriate for remains destined to be permanently destroyed. This has lead to a policy in salvage archeology which maintains that "all the data"

must be obtained. In practical terms this leads to a mish-mash collection of materials which is not usually capable of solving problems of any real substance. It is impossible to get "all the data". Furthermore, there are no natural "data" in the archeological record except that which is defined and recognized by theory. There are many types of remains (many of which are not now known to us) and as these remains come to have theoretical relevance then they are also data (Hill 1972: 63). It might be better stated that some problem-orientations are too limited in terms of research results (Schiffer n.d.a) which they yield. For example, in the formulating of the highway design if all our energies and efforts were to go into the investigation of prehistoric trade we would be unnecessarily wasting information and would not be able to adequately explain trade and how it operates within prehistoric cultural systems when we were finished. Schiffer (n.d.a.: 7-8) has made the argument that regardless of the organization doing research, our greatest understanding of past behavioral systems is most likely to come from data collected over a broad spectrum of problems and relevant domains [see Redman (1973b: 7) for a similar point of view].

In this regard we must walk the tight line of not probing the archeological record with a wide variety of questions and problems and not providing fuller, more comprehensive answers to problems; but on the other hand, not carving off too much to the result that no significant problems are sufficiently investigated and solved. There are no easy solutions to this dilemma but the writing of research designs which pose problems and methods of solution and studies which evaluate the testing of ideas is the only means to avoid either extreme.

An additional word in favor of written research designs relates to the structure and content of archeological reports. Many archeologists bitterly complain about the nature of salvage reports as they usually do not provide types of data of interest to their research. As a matter of fact, given the implicit and incoherent manner in which many contracts are performed the data are often not of any real use to the investigator who collected them. But if research designs are written, carefully explicating problems to be solved and methods of investigation, the contents of a report can only be evaluated in view of the problems formulated and the success of their resolution.

The Anatomy of Research Design

The basic structure of a research design parallels the concept of the scientific hypothesis. In fact, a well-formulated and tested hypothesis is the essence of research designing and execution in microcosm. That is to say, the questions, problems and propositions held to be relevant or valid are used to organize subsequent procedure so that a critical test can occur. While in the case of a single hypothesis the actual formulation and testing may be simpler in design and execution, the flow of operations is still the same for both. A research design, as stated above, must have theoretical goals; accordingly, these goals must be fully explicated for the investigator and his or her peers.

Secondly, a well-constructed design must provide a blueprint of data requirements for exploration and testing as well as the necessary methods or techniques relevant to collection and measurement (Phillips 1966: 77-78). Just as there is no single problem or set of problems in our research, it also follows that there is no single design blueprint for research execution.

The operationalization of research design goes on at several levels. These events range from statistical manipulation of artifact attributes to the complete excavation of sites and subsequent integration of data sets of all scales into higher levels of regularities (Redman 1973a, 1973b; Raab and Goodyear n.d.). The analytical units which are chosen for the operationalization stage should, as much as possible, bear directly or indirectly on hypothesis testing or problem investigation. Much of the data manipulation of analytical units will per force be experimental or exploratory. In order to increase research efficiency, however, the units manipulated should have their relevance to the design spelled out.

The operationalization stage provides the necessary testing and evaluating of the validity of stated hypotheses or the research relevance of certain problems. This is otherwise known as the testing phase. The testing phase has for some time been the weakest point of archeological analysis. The criticism is sometimes voiced that a highly structured research design does not allow for the creative process in archeological research. On the contrary, as Hill (1968: 137-139; 1970: 21, 26) has pointed out, the process of devising test implications which will confirm or deny hypotheses is an extremely challenging and creative task. Furthermore, a great deal of new information, and unrecognized patterns, usually emerge from a rigorous testing procedure. It is with the testing phase that information is confirmed, rejected, and modified and which allows our knowledge of past events to expand.

The foregoing has been an idealized analysis of the stages and direction of designing and executing research. It must be stressed, however, that in praxis it is a dynamic and interrelated system where hypotheses and relevant data are undergoing constant evaluation and reconsideration. As empirical testing takes place hypotheses are accepted, rejected or modified; as modifications take place in the design new problems and new data types are pointed to thus altering the practical side of research. We must be aware of the dynamic and complex character of an operating design since at all times we must monitor its performance. This, in itself, requires that we have in our possession a well thought out and carefully constructed plan. From this it should be obvious there will eventually be no single permanent research design. If there was it would indicate that we had solved all conceivable problems or, more probably, we were not critically examining the performance and efficiency of our research. Our research designs tell us what directions we are going and to what extent we are experiencing success in our overall research goals.

CONTRACT ARCHEOLOGY IN THE HIGHWAY CONTEXT

There are at least two major difficulties pertaining to contract archeology in a highway right-of-way; one of which is shared with contract archeology of all types, while the other tends to be an exclusive problem of highway archeologists.

The first dilemma relates to doing research in contexts which were not dictated out of a deductive framework. Deductive research, regardless of the branch of science, is done best when data collection and measurement is performed by the requirements of a testable hypothesis. As King (1971: 258) has stated, "The site should be selected on the basis of the problem, not vice versa." While it must be admitted that this poses an obvious constraint on the type of problems which can be completely investigated, it is certainly not the case that significant and relevant problems cannot be posed and solved in a contract framework for we have too many examples to the contrary.

What is required in these situations is serious thought and research planning beforehand which will yield important problems and relevant approaches. It can be taken as an indication of the relative strength of contemporary archeological theory that ecological and settlement-subsistence approaches can and have been taken to practically any contract setting and yielded significant research results. It can be interpreted as a sign of great progress when any contract situation regardless of size or setting can be plugged into a series of research designs such as regional investigations, activity-specific problems, sampling problems, or tests of archeological laws. When we are at the point of having developed a multiplicity of on-going designs and problems, then the constraints of having to do archeology in areas dictated by the needs of impacting agencies will be greatly reduced.

The second difficulty alluded to refers to the linear, ribbon-like sampling spaces highway archeologists must cope with. Whereas in many cases contract projects have spatial boundaries which may be isomorphic or nearly so with paleoecological territories, e.g., floodplains, river channels, or mountain slopes, it can hardly be said that narrow transects would effectively cover any one region or major part of a prehistoric exploitive territory. In the highway corridor it is rarely the case that the impact route will follow for any significant distance a single potentially relevant part of the environment. Exceptions might be a highway that follows a lake shore, beach or river terrace, but even so, it is known beforehand that such narrow environmental zones will not constitute the total or a representative sample of the exploitive regions of prehistoric groups.

Thus, it is certain from the outset that a highway corridor will not be equivalent or representative of the exploitive range of past groups but in fact can be expected to cross-cut several environmental types in a narrow line of observation. The fact that highways pass through a variety of ecological settings constitutes a virtue. This virtue, however, needs to be carefully weighed against the sampling

liabilities for regional analysis which are incurred by a linear or transect sampling plan. This type of sampling system, a de facto transect, needs to be considered next.

Perhaps the most influential constraint placed upon contract archeology in the highway context relates to the shape of the impact area. Transects as sampling devices are notoriously inadequate means of deriving statistically reliable variability in geography or space. Exceptions would be in plant ecology sampling where species are organized vertically more than laterally such that some linear measure of variability (elevation) adequately describes distributional variability. The primary reason for their ineffectiveness in archeology relates to their highly restricted observatory powers which do not allow for horizontal or spatial variability in human behavior. Just as linear trenches are inadequate sampling devices for understanding the total spatial variation in an archeological site, so are they unreliable for sampling regional variability of settlement patterns (Mueller 1974).

This will, perhaps, preclude highway studies from generating reliable statements about the proportions or ratios of various activities in a given society's exploitive range. This will be true since we can never get the necessary spatial dispersion which will insure adequate statistical representation of microenvironments and their associated exploitive activities. Furthermore, since sampling units, i.e. highways, are areally restricted (even as are partial random samples using grid squares) it will be impossible to reliably calculate density values for a given settlement pattern or region (Whallon 1974). Even if several highways cross-cut a particular region approximating vectors with random trajectories (Mueller 1974), it is unlikely that statistically accurate proportions of activity types could be reconstructed. Also, the highways of South Carolina, like any modern construction, seek out the higher stretches across moist bottomlands or the flatter, easily accessible parts of mountains in order to facilitate construction. These same environmental situations usually contain several types of archeological manifestations, the result of pre-historic and historic groups seeking similar advantages from the landscape. This will inevitably mean that activities oriented toward or associated with river terraces, beach shores, and mountain passes will be over represented by highway sampling.

The foregoing has emphasized the probable limitations of contract archeology in the highway context. It is not usually productive to categorically state absolute limitations on research since the highways may generate reliable generalizations about regional patterns after all. Regardless, as highway transects cross-cut several environmental zones it seems inevitable that distributions of a regional or paleoecological nature will be suggested, many of which will ultimately be demonstrated and tested by subsequent projects with less geographic constraints.

There are certain positive aspects of contract archeology within highway generated sites that should be brought out and developed. Only by approaching such sites in an innovative and perceptive manner will their information potential be realized.

Single Site Analysis

While it is true that a thorough-going regional approach is not easily permitted by the sampling nature of highway right-of-ways, this is not the case for sampling individual sites. Sampling problems, present at the regional level, disappear at the level of individual sites since presumably we have complete access to their contents and internal organizations. Certain kinds of archeological information are only available through intensive single site analysis. Such information is of a particular and descriptive nature but requisite to behavioral reconstructions, as well as processual information concerning the nature of cultural and natural processes of the archeological record regardless of time and space (Schiffer 1972, 1975; Schiffer and Rathje 1973). Intensive reconstructions of past activities of individual sites is perhaps the area in which the highway program can make its greatest contribution to the archeology of South Carolina and archeology in wider contexts which seek to reconstruct extinct behavior and explain the causes and processes of such activities. Intensive intra-site analysis of single sites with reliable behavioral reconstructions is still one of the weaker areas of knowledge for North American archeology. In fact, much of our general culture historical and even processual understandings of prehistory are based upon trenches or test pits intuitively placed within sites with no provision for either total excavation or probability samples with which to reliably generalize about intra-site behavioral regularities. Given the rich behavioral data which are present within single sites, criticisms regarding the small information return available from single sites are groundless. As Schiffer (n.d.a.: 2) has stated:

... if the archeologist is given sufficient time for research design preparation, analysis and write-up (as well as actual fieldwork), there is no site that cannot provide relevant information for some substantive, technical, methodological, or theoretical problem of interest in archeology.

Culture-Ecological Analysis

Since highways usually extend for several hundred yards if not miles, it is inevitable that several types of biophysical environments will be cut across (Gumerman 1973). Since we are aware of this beforehand, it is important to begin research with a set of environmental observations that will be potentially relevant to discover past man-land relationships. The natural environment of South Carolina is quite diverse ranging from mountains in the western part of the State, foothills and fallline in the center, and the coastal plain which meets the Atlantic Ocean. Inside of these broad topographic landforms occur a myriad of associations of flora, fauna and highly productive aquatic environments. Owing to this extreme diversity in resource types there no doubt existed, prehistorically, many complex sets of man-land relationships. Theories of culture ecology and subsistence have earned a place of importance in archeological studies and accordingly, the highway program should seek to maximize information

available from highway intercepted sites in their physical and biological settings. An intensive ecological analysis of site functions and locations should lead to the discovery of regularities from region to region which can aid in the explanation of certain behavioral processes.

Investigations of Extensive Geographic Scope

Rather than being restricted to one particular area or region of the State on a long term basis, archeology in the highway program allows an extensive and rapid accumulation of information touching most parts of the State. This is valuable to an archeological program of South Carolina since very little is known about most of its culture history. In the immediate few years the highway program should generate data on a wide variety of sites and locations throughout the State treating several phases of history and prehistory. This should provide not only the highway program but other programs within the Institute with a broad variety of information with which to better plan and formulate problems and strategies of research. The highway program can provide an information balance to other research activities within the Institute since its wide ranging and extensive path of investigations will complement the intensive and more geographically circumscribed projects. The benefits available from each to the other will be more apparent as both intensive and extensive programs consult the other for purposes of mutual problem solving.

De Facto Multi-State Approach

Since the highway prism only affects a minor physical area of any region or area of the State (400' x N miles), only a small portion of the total archeological data base is ever contacted and destroyed through investigation. This means that subsequent projects, highway or otherwise, which operate in these previously contacted regions can take advantage of highway studies. The reverse, of course, is also true that the highway program can and should take advantage of prior projects conducted near highway impacted areas. Since there are at present three stages or phases in the highway program (I-Reconnaissance, II-Survey, III-Mitigation) as provided in the original highway agreement (Stephenson 1973), there are several stages with which to allow data gathered at an early stage to modify procedures and goals at later stages. In order to maximize the quantity of feedback available from prior stages several goals must be outlined from the beginning which will allow their evaluation and testing prior to final mitigation. As an example, based upon a systematic, problem-oriented Environmental Impact Statement several important bits of information should automatically be gathered which will allow site-specific and problem-specific questions and strategies to be formulated. This is the basic function of the E.I.S. as it is intended to be a study to aid in future planning. Agencies including archeologists should explicitly allow preliminary studies to systematically feed information to later ones. Attendant to the notion of feedback through stages would be the concept of long-range studies where investigations of all scales are designed to have input into future projects and designs.

Theoretical and Methodological Contributions

While the areal sampling limitation of highway archeology has been recognized this does not mean that through intensive intra-site analyses, man-land studies, and behavioral or activity reconstructions that the highway program cannot produce and test interesting hypotheses and models. In addition to formulating or suggesting models relevant to prehistoric adaptive regions, highway studies can partially test these models as well. While perhaps inter-site and intra-regional models of settlement pattern may require subsequent projects of non-highway related organization for their decisive confirmation, nevertheless, much of this testing must take place within single key sites. This is within the investigative power of the highway program. New methods of analysis and new models of interpretation are rapidly accumulating regarding spatial analysis and the discovery of cultural formation processes of archeological remains. Highway generated sites can be used to test as well as devise laws surrounding the growth and decline of archeological sites.

A GENERAL DESIGN FOR THE HIGHWAY PROGRAM

It is generally accurate to say that contemporary archeology is striving to make scientific explanations at two levels. First, at the most abstract level, to explain through the use of laws the origins, functions, and extinctions of past human societies. In as much as this is the overriding goal of social science in general, archeology assuredly is a social science discipline. At a lower level of abstraction archeology must explain or reconstruct particular events of past societies in terms of another set of laws which relate to the formation processes of the archeological record which consider both behavioral and natural processes (Schiffer 1972, 1975; Schiffer and Rathje 1973; Binford 1971). In the past, these goals and the actual operation of highway archeology have seemed to be fairly disparate. In terms of designing archeological research, however, goals of this nature must be kept in mind at all stages of research in order to achieve a mutual interdependence of theory and practice.

It would be unrealistic to presume that the highway program will immediately make contributions at the first level of explanation. In fact there is a great deal of work to be done at the second level within archeology in general, not to mention an embryonic highway program. This latter refers to the virtual dearth of rigorous and credible behavioral reconstructions available in archeology for higher model building and theory testing. At this second level the highway program can immediately apply itself, and with an eye toward the first goal.

At this state in the development of our knowledge about the pre-history of South Carolina very little is known about basic culture historical patterns, a point effectively illustrated by Anderson's (1974) well conceived study. This does not mean, however, that it is necessary to do culture history first and wait until a sufficient quantity of data

has accumulated before asking questions regarding behavioral processes (Hill 1972: 100; Binford 1968b; Leone 1972: 26; Leblanc 1974: 658). For many types of archeological remains it would be too late by the time "all" or enough data were collected and the data collected under a strictly historical paradigm are usually not capable of testing hypotheses about many sets of behavior. Most culture-historical frameworks rely on simply formal or morphological units of analysis with at best implicit and untested inferences about functions, e.g. ceramic and lithic "types", house shapes, and their distributions in time. These kinds of data will be automatically collected in pursuit of certain objectives outlined below but will be treated and hopefully understood from a behavioral point of view as referents of extinct functional systems.

The general occurrence of archeological complexes in South Carolina can be expected from work accomplished within the State as well as more abundant work performed in neighboring states such as North Carolina, Georgia, Tennessee and Florida. Reconstruction of the culture history and prehistoric lifeways of the extinct inhabitants of South Carolina will gradually accrue as a by-product of behavioral research. While knowledge concerning culture history is interesting and useful and forms parts of the general fund of archeological knowledge, it is not the primary goal of scientific archeology. When historical questions are pursued for their own sake, they tend to generate descriptive information, particular in nature, and non-explanatory in function.

Goals of the General Highway Research Design

The primary goal of the general research design is to systematically explore and reconstruct past activities represented by highway intercepted sites. The reason for focusing upon single site or intra-site analysis relates to the previously discussed limitations of transect sampling which are inherent to highway corridors. Accordingly, it would seem apparent that highway archeology could make its most significant contribution by analyzing sites for their internal regularities made comprehensible by behavioral reconstructions. Even the goal of intra-site behavioral reconstructions and the formulating of explanations of those behavioral processes is a rather expansive one and must be specified as to parts.

Before discussing sampling problems related to fulfilling the basic goal of behavioral reconstructions, it is necessary to comment on the meaning of the term site. The designation of site, like all scales of measurement, is to some extent arbitrary and approximate. What we really mean are empirically detectable manifestations of archeological remains. Such remains are not automatically isomorphic with certain human activities but it is human behavior that we ultimately wish to sample through the use of archeological records (Reid, Schiffer and Neff n.d.). Although we physically sample archeological remains we must consciously attempt to make these sampling procedures collect data directly related to behavioral correlates. While this may seem an obvious point, in as much as the entire purpose of studying archeological remains is to make inferences about past behavior, the manner of sampling these remains that will allow behavioral inferences is not so straightforward a matter.

Considerations of Intra-Corridor Sampling

Since it is assumed that past activities were caused and structured it is necessary to search for patterns by a series of sampling procedures that are most likely to elucidate them. At the grossest level of partitioning archeological manifestations it should be clear that no set of remains regardless of how large or small should have automatic priority over other manifestations. Unless considered within a specific problem framework, there is no reason a priori why a temple mound or burial mound is necessarily more important than isolated sherd and chip scatters. Obviously such radically differing manifestations are not behaviorally equivalent but presumed differences must be explicitly spelled out and sampling procedures designed accordingly. There is a tendency within archeology to define the larger, more complex sites as more "significant". Undoubtedly for certain behavioral questions the large and complex sites would be treated differently from the other less densely deposited remains. But we must insure that all types of remains are given sufficient and adequate study if we are to ultimately understand the complete nature of extinct cultural systems.

As previously mentioned it will be necessary to ameliorate the biasing effects of certain factors such as season of survey, whether or not a site has been plowed, type of vegetation cover, and informant-located sites. In order to maximize the chances that all possible types of archeological remains have at least some chance of being discovered it will be necessary to sample in areas where there are no apparent manifestations as well as where there are. We cannot afford to leave site discovery to the uncontrolled vagaries that provide for bare ground.

Another major sampling problem relates to subsurface manifestations. Just as it cannot be assumed that all sites found from unsystematic open-ground surveys are representative of all possible types of sites, it also cannot be assumed that uncontrolled surface collections reliably indicate the true situation about subsurface remains. Given the rather substantial tracts of non-observable surfaces and subsurfaces of highway corridors, some type of objective sampling procedure needs to be employed to accommodate both problems. This problem has been met with limited success by sporadically testing vegetated areas with shovels by hand. The problem with this method is that it is not systematically performed such that one impact area is comparable to another and secondly, it is often too time consuming to adequately hand test significant portions of an area.

One potential method of efficiently examining several loci along an intended highway strip would include the use of a back-hoe with a scraper blade and trenching bucket. The back-hoe can be taken to most places where highways will be constructed and hand excavations of pre-determined size could be used where the back-hoe could not be taken. The sampling loci worked by the back-hoe can be pre-determined by a probability method which designates a certain number of sampling loci per mile. Probably a grid would be needed to adequately disperse sampling loci on a map to prevent spatial clumping common to simple random samples. At each sampling locus a set number of square feet would be scraped, removing

vegetation and humus. After scraping the immediate surface, the back-hoe could cut a trench to search for deeply buried sites. The depth necessary for trench cutting will be determined by sediment types and indications of sedimentary processes by local geology. For example, river terraces and the edges of swamps have a high probability of containing buried sites. Doubtlessly special prehistoric activities transpired in or near biotically rich wetlands which are unknown to us by present survey methods.

The number and extent of back-hoe tests of a given highway strip would have to be determined through experimentation in different environments. For example, 10 testing loci per linear mile would mean approximately 1 test per 500 feet. Other costs such as time, labor and machine rental will have to be considered and weighed against the amount of information generated by the method. It should be emphasized that the purpose of a standardized machine sampling method would be to simply discover evidence of archeological remains and not necessarily sample the remains themselves. The mere recovery of a flint chip by the back-hoe tells us what we initially want to know -- that a site is present. Subsequent investigations of a site may entail machinery but it should not be construed that in the initial sampling phase the back-hoe is designed to investigate the nature of a site. By the same token it will probably be too expensive in both time and money to machine-sample or hand-sample a statistically meaningful fraction of the proposed highway corridor. Its primary purpose would be to systematically probe a corridor looking for unobservable sites in an unbiased manner allowing us to assess and subsequently investigate new examples of archeological remains.

Intra-Site Sampling

Since highway sampling essentially restricts sampling reliability to single sites studies, our sampling strategies should focus as much as possible on describing and explaining the existence of individual sites in terms of past behavioral systems indirectly reflected in archeological remains. In achieving this goal it is likely that several successive phases of sampling will be required.

As an individual site is discovered, detection requiring the mere presence of a single artifact or humanly modified environment, several assumptions must be kept in mind. First, and until empirically demonstrated to the contrary, non-random distributions exist on both the observed surface and in the subsurface. Most currently used survey techniques do not adequately measure spatial variability on any intra-site dimension. The mere unstructured collection of a bag of artifacts only tells us reliably what we already know, ... that a site is present. Even unstructured surface collections are probably not reliable indicators of the complete occupational history of a site, although they are commonly used for that purpose. Second, surface remains and their distributions may or may not accurately reflect subsurface remains (Redman and Watson 1970). Therefore, some subsurface tests are required, the extent of which will depend on the degree of reliability sought as well as the complexity of questions being asked. For example, if the question is, "What are the phase occupations of this site?", then a series of test

pits may be sufficient. If the question is, "What are the spatial distributions of activities conducted at a site?", then a more complex sampling procedure is required. Finally, sampling and analysis procedures should take into consideration the formative affect of both cultural or behavioral and natural processes which structure archeological records (Redman and Watson 1970; Schiffer and Rathje 1973).

As will often be the case, especially in the early years of the highway program, very few guidelines of a cultural and environmental nature will be available for sampling stratification. In view of this fact, a probability sample which is stratified by a grid system to insure dispersion should be used in the beginning or exploratory stage of excavation and surface collection (Redman and Watson 1970; Goodyear n.d.). The experimental paper of Redman and Watson (1970) is a particularly useful example of the interaction between exploratory sampling, hypothesis formulation, and testing. After a specified initial sample fraction has been obtained, subsequent sampling procedures can be based upon patterns and hypotheses abduced from the first or earlier stages. Collections made by an exploratory probability method during an Environmental Impact Statement study, or intensive survey, can be initially analyzed and used to generate problems to be investigated during final fieldwork. If the benefits of multi-stage fieldwork (Redman 1973) are to be realized in the highway program we must constantly search to find ways in which earlier phases can feed information and problems into later stages.

It should be pointed out that there has been some tendency to discount or minimize the research value of surface sites or sites that exist solely in the plowzone. Even in cases of surface sites that are strongly suspected of having had their spatial relationships badly disturbed, much useful information can still be obtained. For example, the ratios and proportions of certain tool classes or refuse types will still be present, barring the effects of amateur collectors. In other words, the material contents of past activities are recoverable, if not the precise form and structure of those remains. For certain hypothesized activities the ratio of tools to debitage or jar rims to bowl rims might be critical to behavioral identifications (Goodyear 1975). In the case of heavily plowed fields there is still some debate as to what effects the plowing has on the archeological record. Sites which have been heavily plowed should be approached from an experimental point of view and the extent of spatial clustering or obliteration of spatial aggregation, examined by mapping and with statistical techniques (e.g. Whallon 1974).

During current surveys performed for Environmental Impact Statements we have been experimenting with intra-site surface sampling methods. In those highway corridors which possess plowed fields a statistically based sampling method has been used to make controlled surface collections. Basically, this method is an adaptation of the system described by Redman and Watson (1970). The method involves setting up a site in a theoretical grid system on graph paper, choosing randomized X and Y axis coordinates and sampling their point of intersection. The angle and distance to each random point from a common datum is then transferred to a master list and taken into the field. At each sampling point a circle 10 feet in diameter

is exhaustively collected of all macroscopically detectable artifactual remains. The advantages of such a method are that the sampling fraction of a site surface is known and can be specified before hand, all portions of a site have equal chance of being selected as well as all visible classes of archeological data, and the data are amenable to a wide variety of quantitative analyses.

For example, various computerized mapping programs can be applied to the circle data. In a recent application of this surface-circle method on plowed sites in the Camden area, 38KE18, the programs SYMAP and SYMVU were run. This site is near the famous Adamson Mound (38KE11), a large South Appalachian Mississippian temple mound center. The site of 38KE18 is suspected to be a large village related to this temple mound center. Upon running the SYMAP program on the variable "all aboriginal ceramics", a rather suggestive circle pattern appears (Fig. 1) which may be the outline of a palisade. The cultural formation processes of a village ringed by a wall are such that habitation refuse is contained within it. The bare area in the middle might be a plaza area kept free from trash and the opening in the ring is oriented due east. Several runs of factor analysis have been made on these data with subsequent attempts to spatially identify the various factors. Obviously any number of statistical methods can be applied to data collected in such a manner.

In primitive, low-energy societies whose settlement-subsistence routines take them to many parts of a region, some activities may yield only small or infrequent artifactual remains. As Schiffer (n.d.b) has pointed out for the northeast Arkansas Dalton settlement patterns, some activities may be, for all intents and purposes, archeologically invisible at least by our current means of site detection. The distinct possibility of small groups of individuals occupying space for brief periods of time should be taken into consideration when analyzing and surveying settlement patterns and increased attention should be given to the small, more ephemeral manifestations.

Intra-Site Domains of Analysis

It is with these specified problem domains that the highway design will focus on systematically obtaining data which will potentially allow reliable reconstruction of past activities. There are several ways to approach this type of analysis and many of the following observations will no doubt be overlapping to some extent. Nevertheless, a design must begin somewhere and the sooner the empirical side of the program is evaluated the sooner its overall efficiency and relevance can be determined.

Before discussing these domains and examples of their operational units, it is important to be mindful of the complex and systemic nature of human behavior and the material record that is somehow correlated with past activities. It would be a dangerous oversimplification to straight-away interpret many of the observational categories we use in archeological analysis as directly equating with special activities or areas where

0.0 MINUTES FOR MAP

38KE18 IAA ABORIGINAL CERAMICS
ANDERSON/GOODYEAR - 38KE18 - ABORIGINAL CERAMICS
HIGHWAY PROJECT

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
(*MAXIMUM* INCLUDED IN HIGHEST LEVEL ONLY)

1.33	5.33	13.33	13.33	66.67
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FIGURE 1

particular activities were conducted, Schiffer's (1972, 1974) criticisms of unreliable and superficial explanations for material arrays are relevant here. The material record is a mute and indirect record, one that requires several explicit transformations in the form of arguments of relevance and laws in order to derive highly probable inferences about unobservable extinct behavioral systems. The physical condition of an archeological site is wholly conditioned by cultural and natural processes. The processes or forces of record formation are presumed lawful and regular and thus it should be possible to derive an explicit set of laws which can be used to explain the physical condition of archeological remains. While archeologists have been aware for some time of the natural processes that effect archeological remains (Schiffer and Rathje 1973; Schiffer 1973), for the most part we are still lacking a set of principles with which to explain the nature of archeological remains in terms of human behavior. Accordingly, it is necessary to be cognizant of the multivariant forces which create archeological records when constructing interpretive arguments of past human behavior.

I. Cultural Identification

At this level of archeological identification it should be possible to isolate certain indicators which allowed prehistoric groups or "societies" to identify and distinguish themselves from other contemporaneous societies. Society can be thought of in a behavioral and adaptive sense as Harris (1971: 136) has defined it, "... a group of people who are dependent upon each other for their survival and well-being." While this does not exclude the fact that people who group themselves for mutually beneficial purposes also share similar cognitive or mental states, the fact remains it is difficult to examine these phenomena even among living populations, much less dead ones. The behavioral aspects of social integrity are just as important as the presumed cognitive ones and short of mental telepathy the latter are always transmitted through the former. In this behavioral communication or transmission of social information several material items are used to aid in non-verbal transmission. At the point where physical items such as dress, ornament, decorations on tools and weapons, mode of burial, etc., are employed to maintain social structure, archeology begins its analysis. Cultural identification need not correlate with the nearly useless task of attempting to dig up a "tribe" or a "culture"; such anthropological units have not been generally defined behaviorally (except implicitly), and certainly not materially, but usually through cognitive and linguistic analysis. Therefore, they are not equivalent or perhaps even useful for archeo-behavioral analysis.

The types of data archeologists might use to define social groups or societies need to be partitioned away from specific functions relating more directly to economy or technology. Such socially relevant data, however, can, and often do, reside at the same locus, such as the shape of a projectile point which has both functional and social duties (Binford 1962). Also, many types of social units such as residence groups while having explicit social and ideological aspects, have latent functions as

well, such as labor organization. There comes a point in archeological analysis where patterns are no longer explicable simply in terms of techno-functional and techno-environmental variables; the impact and presence of other human beings must be considered as well. Perhaps cultural identification might also be considered as an analysis of the function of material items in maintaining and communicating the structure of social relationships.

The use of artifact classes for purposes of reconstructing socially similar prehistoric populations is perhaps the most common strategy for performing social identifications. Often the analysis stops at this point with the manipulation of "traits" in terms of phases. While there is little doubt as to the spatio-temporal validity to many of these aggregations, until recently there has been little attempt to investigate the social and behavioral meaning of such clusters. Cultural identification in this design does not simply equate with the matching of artifact classes against preconceived trait lists, or so-called "diagnostic" artifacts of culture-historical phases. While such frameworks can be of some value in communicating archeological variability to other investigators and for gross time-space parameters (more precisely chronology), they are not necessarily referrable to societies, or mutually interactive populations, and certainly cannot be reliably equated with activities. At a general level, too many cases are known of a widely shared technology by socially distinct groups to permit such transformations. The use of Coke bottles or Volkswagons, for example, would hardly be useful indices for mapping out national boundaries in the western hemisphere. By the same token, however, this does not mean there is not significant variability with regard to space or correlations with other types of technology and material culture. But such variability is to be determined and explained and its significance must not be presumed a priori.

The use of material culture by both historic and prehistoric societies for purposes of social grouping or identification is rather well known. In our culture the various styles of architecture, building material, and residential locus all have meaning in social terms. In primitive societies the shape, color and raw material of several types of technology often serve functional purposes in differentiating groups, as well as to help maintain inter and intrasocietal organization. As an example from Paleo-Indian studies, Wilmsen (1973) believes that perhaps different local groups are represented at the famous Lindenmeier site based upon different styles of flaking apparent on different clusters of fluted points. Knudson (1972) in her work with the Paleo-Indian Cody complex has isolated techno-stylistic clusters which seem to have regional distributions. These examples were offered since attributes of lithic technology were employed, a medium often disregarded as a potential source of social distinction or differentiation.

Perhaps the most developed use of material culture for purposes of social identification and differentiation has come with attribute analysis of ceramics (Longacre 1968; Hill 1968; Leone 1968; Woodall 1972). Various functional and non-functional attributes, particularly those of vessel morphology and decoration, have been shown to be useful indices for differentiating remains on the basis of intra and extra-residence group

patterns. Using burial patterns and associated grave furniture, Peebles (1971) has produced evidence of socio-political structure reflective of the internal rankings of chiefdoms.

By using reconstructions of settlement-subsistence systems, i.e. sites and their reconstructed activities which seem continuously articulated throughout a region on a relatively synchronic basis; and by using certain artifact attributes as probable indices of socioideological and sociopolitical relationships, cultural identification can be performed. Rather than conceiving of these reconstructions in the traditional anthropological sense as ethnically joined units, it would be more useful to consider them as population aggregates which share a specifiable degree of behavioral similarity as reflected through organizations of material culture.

II. Activity Analysis

As previously discussed the analysis of individual sites in terms of past activities is the primary goal of the general highway research design. The accomplishment of that goal requires that some attention be devoted to understanding archeological records as products of both human behavior and natural processes. It is useful to think of archeological records as having, in a purely morphological sense, three basic properties. These include content, form, and structure (Schiffer 1972: 156). In order to reliably make inferences about the behavioral meaning of the archeological record these three properties must somehow be accounted for.

Much of the archeology of the past decade which engaged in behavioral reconstructions (e.g. Longacre 1968; Hill 1970; Binford et. al. 1970; Thomas 1973) has been successful in deriving behavioral correlates of hypothesized activities based primarily on the predicted contents and their distribution or context within sites. While the utility of behavioral correlates is not questioned, as Schiffer (n.d.c) has pointed out there is still a problem of the reliability of behavioral inferences. This is true since the arrays in question may or may not reflect the past activities of that locus or at that site. Numerous intervening variables such as secondary refuse formation (trash or dump areas), curation activities where tools are transported in use from site to site, recycling processes where artifacts of one functional set are rejuvenated or refurbished, laterally recycled by modifying objects of one functional set into another, scavenging of archeological remains by one group of another group through time, as well as modern cultural formation processes such as relic collecting and plowing. All of these factors influence the morphological condition of archeological records, thereby complicating their interpretation.

Many studies which interpret the contents and distributions of archeological arrays in direct behavioral terms make the assumption that such a pattern equates with the last episodes of use and that such items were abandoned at or in the same behavior space (Schiffer 1972: 156). Primary refuse, or remains that correlate with the last behavioral events

and their spatial locus of use (Schiffer 1972: 161), undoubtedly exist in the archeological record. But inferences or interpretations referring to primary refuse and other classes of remains should be explicitly argued in terms of the activities and cultural formation processes such remains are said to represent.

To effectively explain the content, form and structure of archeological records requires extreme attention to sampling strategies. The contents of a site both in a qualitative and quantitative sense refers to the types of remains. The presence of grinding implements or chipping waste merely refers to their presence or absence. It is also necessary to know with some statistical reliability the ratios and proportions of items with relationship to each other. The ratio of debitage or waste material to finished and broken tools is an obvious example of such a property.

The form of the record is also an important referent to human activity. Horizontal and vertical shape can reflect the size of occupational group, the number of visits to an activity space, the spatial requirements of certain activities, e.g. whether such activities were performed by individuals or groups, standing, sitting or using portable versus non-portable facilities. The form or shape of the record can be analyzed best in terms of spatial analysis and is amenable to various statistical treatments (Whallon 1973, 1974; Hanson and Goodyear m.s.). Sampling considerations again are present since it is often necessary to open up extensive portions of sites in order to evaluate spatial distributions; or to employ statistical sampling procedures which reliably estimate the size and position of site contents (Redman and Watson 1970; Goodyear 1974).

Finally the structure of the archeological record, that which refers to the regular statistical correlations among items in space, is produced from the integration of form and content. Such structural reconstructions when understood in terms of patterned human activities are the goal of behavioral research.

A great deal of activity reconstruction in archeology has been successful on the basis of content variability within and between sites, contents whose functional meaning is fairly well understood. At the gross settlement pattern level, differential distributions of houses, burial mounds, knapping and quarrying manifestations are sufficiently obvious to give direction to activity reconstructions. At a finer level, particularly at the intra-site level, subtle differences in activities will require detailed attribute studies of material items which reflect specific functions and their spatial covariation with other functions.

III. Subsystem Reconstruction

While intensive reconstructions take place for single sites, it is important to bear in mind that the particular site at hand in reality

participated in a wider settlement system. While each discrete site should directly reflect the subsystem or subsystems in which it participated, other subsystems will also be indirectly implicated. As an example, it is known that chert does not naturally occur in the Fallline area of South Carolina. The presence of chert artifacts at sites in this region would imply some type of procurement system either by trade with intermediate populations who resided in the region of that resource, or by some direct means of procurement.

In sedentary villages or communities of a relatively long term occupation over a yearly period, other subsystems will be suggested, particularly with regard to subsistence. The presence of nuts and animal bones from habitats beyond the immediate ecological habitat of the village, particularly aquatic animal species, would certainly imply the existence of other activity subsystems. Many of the obvious wider subsystems indicated by any one site relate to subsistence and resource procurement. This is partially attributable to the fact that technological remains associated with subsistence activities are ubiquitous and, comparatively speaking, more preserved. Analyses of these types are relatively straightforward compared to other subsystems in which primitive societies are known to engage. It should be possible to reconstruct other aspects of cultural systems such as those relating to political and religious organizations, particularly if we come to view our data as regionally operating entities. Some work toward regional analysis of late prehistoric socio-political systems has already been started (Ferguson 1971, 1975).

IV. Ecological Analysis

Human societies of all organizational scales are directly and indirectly articulated with their biophysical and social environments. In other words, all societies have an ecology; they are each a part of an ecological system. Broadly conceived, our research should inform us about the adaptive or regularly responsive nature of past societies as organizational systems with biological, environmental and social parameters. In low-energy societies (Harris 1971: 200-218), the articulations between the social and biophysical are rather direct since the organizational distance is shorter. Societies of a higher organizational complexity, such as the colonial and industrial societies that occupied South Carolina during the historic period, also had a variety of ecological relationships but with social environments assuming an increased causal role. It would be profitable to think of past societies of the State as existing on a continuum of lesser to greater direct articulation with the biophysical environment depending on the degree of organizational complexity.

One obvious constraint in studying paleoecologies of past groups in the Southeast in general relates to the environmental changes which have occurred during the Afro-European period of occupation, changes which are continuing at the moment. Specifically, the vegetational picture is known to be radically altered. Vegetation is perhaps one of the most useful indices of past environments since vegetation is a sensitive expression of the condition of the total ecosystem. Most subsistence resources of

primitive societies come from plant resources which form a stationary and predictable food base. Secondly, animal populations are ultimately structured by floral conditions. In spite of alterations in native flora there remain at least two fruitful approaches to paleo-ecological studies.

The first approach refers to paleoecological records which can be recovered in buried sites. These include obvious remains such as sediments, pollen, macrofossils such as charred seeds, nut hulls, and plant remains, and frequently faunal remains. While these data are rather specific in terms of aiding in paleoecological reconstruction, they are not always preserved and they are expensive to have analyzed by specialists on a large scale basis.

The second approach refers to the basic geomorphological and soil conditions which have probably changed very little in the past 10,000 years. The spatial location and context of even open sites can provide a great deal of information about past human ecologies and can be used to block out gross environmental parameters. Even very basic associations such as floodplain, fall line, foothill, and littoral, if systematically observed can have great research value. Such basic landforms and micro-topographic features have changed very little during the Holocene. Importantly, such elements as topography, elevation, hydrology and soil type all exert a strong influence in determining the content and structure of biotic communities. Such data as topographic setting, linear distance to permanent water, type of water source, drainage rank, and soil type (Plog and Hill 1971) are often available from U.S.G.S. maps and Soil Survey maps, costing virtually nothing to obtain. Data pertaining to contemporary broad environmental conditions as just described, when coupled with on-going studies of subsurface paleoecological records whenever preserved, can be joined to provide a highly useful study of past cultural ecologies.

Summary of General Problem Domains

The four problem areas just discussed are designed to give some theoretical direction at a general level for the investigation of types of sites regardless of their position in time and space. These categories are necessarily broad. It would be a relatively easy task to list a series of data types or specific observations under each of these problem domains. In Domain II, Activity Analysis, several useful tactics for studying the manufacturing and use-patterns of both lithic and ceramic technologies immediately come to mind. The listing of specific data types or observational categories has been purposely avoided at this stage of the general design in order to maintain necessary flexibility. As various occupational phases of the State's past are encountered and analyzed each in terms of their environmental context, data types can be experimentally derived that seem to offer the best information return. In time and through repeated studies of various occupational phases in their regional settings, it should be possible to increase the specificity and relevance of observational measures by regions. The purpose of describing the four problem domains in the general design would be to insure their recognition before, during,

and after field studies and to systematically investigate archeological patterns relevant to each domain. There is also the belief that by explicitly considering broad topics such as these there will be an increased capability to compare processes of changing cultural systems regardless of time and space.

RELATIONSHIPS BETWEEN THE GENERAL DESIGN, ENVIRONMENTAL IMPACT STUDIES AND SPECIFIC RESEARCH DESIGNS

The highway program as it is now structured has three basic phases of field investigation (Stephenson 1973). Reconnaissance Survey (I), Preliminary Site Examination (II), and Salvage Excavation (III). The first two phases come largely under the purview of the Environmental Impact Statement. The third phase, Salvage Excavation, is the final field study undertaken in a highway corridor and is intended to mitigate archeological resource loss primarily by, although not restricted to, excavations.

Environmental Impact Studies

It is important that all phases of field and laboratory study have some information input toward the general design and to each other. This is generally desirable since each phase of field research differs in terms of intensity of data collected, and consequently differs with regard to data reliability.

That phase with the weakest observational powers, the Environmental Impact Study, in particular needs serious review and upgrading. The primary limitation here relates to unreliable estimates of total above and below ground archeological resources of a highway corridor by currently available sampling methods. While there is no doubt that surface surveys even in heavily vegetated areas can and do produce archeological sites, and as such can feed some data into the general design, the reliability and general efficiency of the E.I.S. phase must be constantly monitored by subsequent phases which utilize more intensive subsurface and surface sampling techniques. For example, is it possible to reliably estimate even the number of occupation phases of a site from surface inspections, even disregarding the factor of heavy plant cover? How easily and reliably are the spatial limits of a site determined by current surface survey methods? Such types of information are regarded as fairly minimal in light of the kinds of questions we would ultimately like to pose for archeological settlement patterns; and there is a great deal of uncertainty as to whether even these simple questions can be reliably answered during the E.I.S. phase.

This points out the need for subsequent field studies to begin a role of data verification for E.I.S. stage fieldwork. The reason for this is rather apparent. Many E.I.S. studies will be made which do not ultimately lead to project completion. As a result, unless there are some confidence limits known for these studies there will always be some

question as to their research value. While there are obvious legal and professional obligations fulfilled in performing E.I.S. studies for other agencies, we want to make sure that the primary underlying objective -- the acquisition of significant archeological information -- is also fulfilled. This latter goal is the basic reason for doing archeological studies, regardless of the source or impetus.

Verification of E.I.S. observations can be potentially made through several statistical methods. For example, the number of occupational phases or discrete components generated by an E.I.S. study in a particular region where physical conditions are known (e.g. plowed fields, pineneedle duff layer, powerline transmission route, eroding landsurfaces) can be checked against the actual number of occupation phases produced by subsequent excavations on the same sites. Marked differences between the number of phases produced by each type of investigation could be evaluated by contingency tests. The physical conditions influencing surface and limited subsurface sampling, such as those just mentioned, would have to be couched in regional contexts. For example, sites studied in uplands which are slowly degrading would be treated differently than floodplain sites subject to alluvial aggradation.

Another example would be estimates of deposit space, depth, site shape, and artifact density. Many of the sites in South Carolina, especially in the upland country, are not deep and it might be possible to reliably estimate parameters of site morphology during E.I.S. phase studies. Since such variables as length, width, depth, and artifact density are metric measurements, various statistical tests may be employed which evaluate differences of central tendency of continuous variables.

While the E.I.S. phase studies are certainly useful to some extent even in their present form, they should be monitored in order to identify their weaknesses and strengthen them where possible. To reiterate, E.I.S. studies in many cases will be the only fieldwork done in certain localities since not all projects evolve to a construction or mitigation phase. Therefore, some estimate of their data reliability must be available.

The E.I.S. phase is also critical since it is the first phase of field studies performed in a highway corridor (Fig. 1). During this phase the limited fieldwork undertaken, such as intensive controlled surface collections, minor subsurface testing, assessment of site morphology and occupational history, will be generally guided by the four problem domains of the general research design (Fig. 1). The broken line feeding back from the E.I.S. box to the general research design (GRD) indicates that the feedback to the GRD may be somewhat minimal and unreliable, at least in the beginning years. The E.I.S. phase should have two major objectives. First, would be to gather as much relevant data (as generally defined by the GRD) as possible; and secondly, to begin to look at the particular impact area in terms of site-specific characteristics as well as potential regional patterns. The latter function is essential for the creation of a specific research design (SRD) which will be constructed prior to actually performing final phase mitigation work.

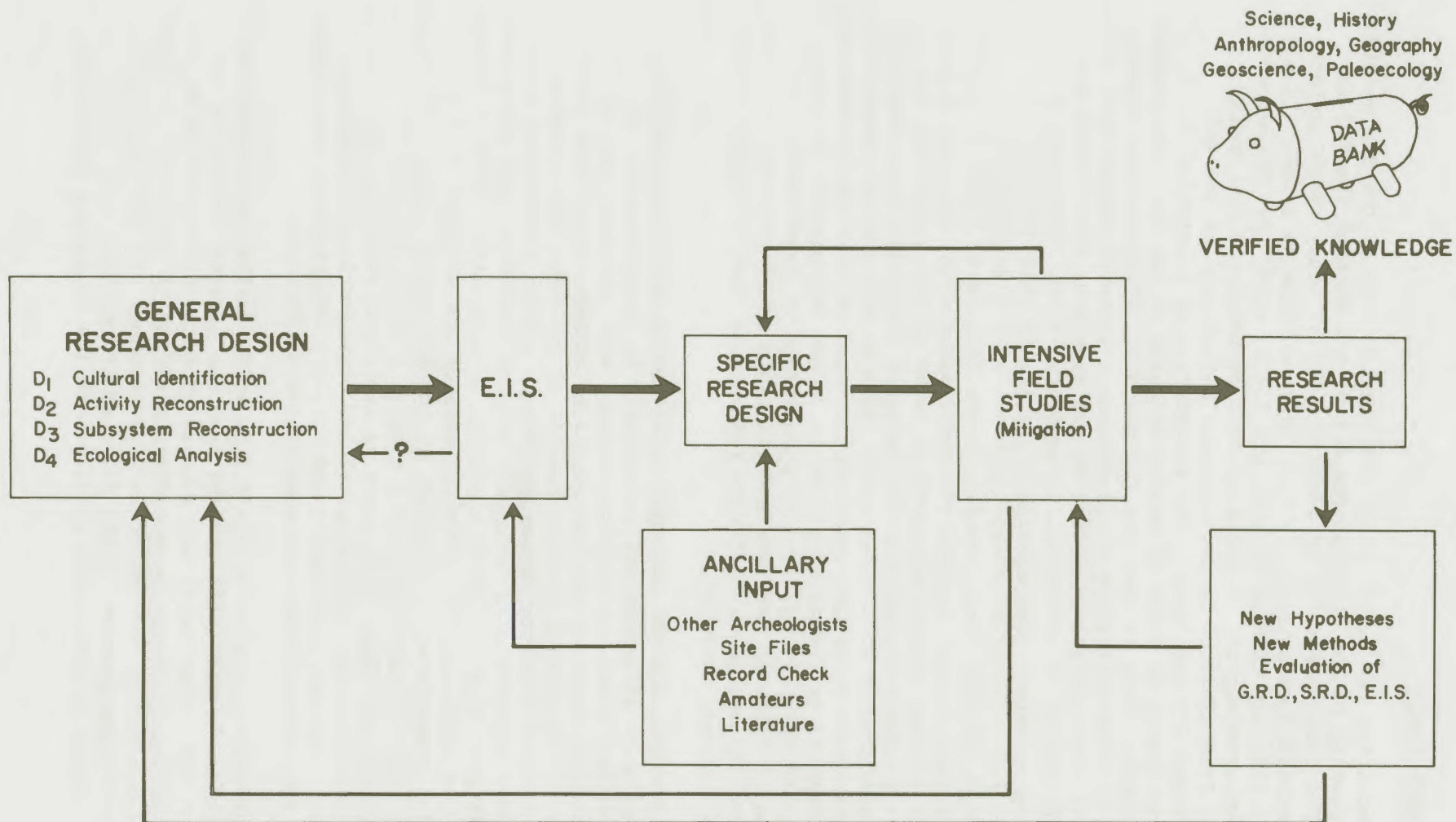


FIGURE 2

Specific Research Design

During and after the E.I.S. stage the construction of the SRD should be started. Depending on how thorough the E.I.S. is, much of the SRD may be in hand. The construction of an elaborate E.I.S. study which explores the various problem domains could in many cases suffice as a SRD. If a long period of time has elapsed between the E.I.S. study and the commencement of highway construction it might be well to prepare a new design which benefits from advances in theoretical, methodological and substantive knowledge for that area. The preparation of a detailed E.I.S. study which can double as a SRD is useful in spite of the fact the highway may never be built. This is true for two reasons. First, if the highway corridor does require mitigation field studies a research design will be needed for that locality and it should be one that best accentuates and complements the nature of archeological manifestations. Secondly, a general pooling of extant data already available in that locality, the description of E.I.S. observed manifestations, plus a general set of questions that would link those remains to the GRD, is of value in itself. It is apparent that however limited the undertaking might be, that a SRD which attempts to link survey data both in terms of intra-corridor and intra-regional patterns is valuable for refining knowledge about regional patterns and patterns of the single site. Such an SRD does not necessarily need to propose final solutions, make predictions, or have in its possession intensive studies of retrieved data. While it may be possible in some cases to be quite specific in terms of predictions or hypotheses, just the generation of relevant problems and questions is of great value since they give direction and goals to future research in that locality, region or even extra-regional contexts.

In constructing the SRD the data requirements and their sampling procedures should be delineated as extensively as is practical. The specificity of data types and sampling designs will in large part be directed by locally observed manifestations by attempting to link those patterns back to the general problem domains of the GRD. For example, questions concerning activity reconstruction of a late prehistoric site with deep midden deposits will obviously require different data types and sampling strategies than a lightly scattered archaic site. Each of these, however, must be approached by different methods and analyses in a way that will allow comparison, if desired, at the behavioral level. The study of task group size and activities is a general problem relevant to any extinct groups but one whose data types or empirical referents will be different according to the technological and organizational complexity of the society. The use of behavior and activity organization are frames of reference that should transcend substantive differences.

While the data generated by the E.I.S. study derived by surveys and limited subsurface testing will perhaps have the greatest impact on the content of the SRD, other ancillary sources of data can and should be exploited. Referring to Figure 1, one obvious source of data would be site records available within the Institute of Archeology and Anthropology's Site Inventory or other museums in the State which may have site files. An important source of data often available in the immediate area of the

project is that of amateur collections. Quite often, adept amateurs make intensive collections of artifacts and map the sites. Although sample reliability is always a source of problem in these cases, nevertheless, the mere presence of certain types of activities and cultural phases can be determined from such collections and thus can have value in ascertaining the larger archeological picture of the highway corridor. In many cases the location of sites and their materials curated by amateurs will be the only ancillary sources of information available for a particular locality.

Another important ancillary source of SRD input would come from archeologists who have had either research experience or who have made theoretical considerations (published or otherwise communicated) of the project area. Input from other investigators should be sought and considered in the planning of the SRD. Highly relevant information about substantive or practical problems may already be known, as well as previously derived models or hypotheses which could potentially be tested by the ensuing project.

Finally, at the broadest level the published literature of the Southeastern area and for nearby regions should be considered in light of widely recognized problems. Many of the archeological manifestations known from any one region of a state usually appear to express relationships with regions from other neighboring states. Although at the substantive level much of the analysis and interpretation will perforce consider the remains generated out of the project, such remains once functioned in a regionally active system and were once articulated with wider areal cultural and environmental systems (Sears 1967: 67).

Research Results

The outcome of an actual field operationalized SRD will be evaluated in many ways (Fig. 1). In a substantive way, the field and laboratory analyses will increase and refine our knowledge about particular manifestations as they are observed in a certain region. Such information will have been accumulating since the first E.I.S. stage. Much of this information even of a descriptive or factual nature will be of interest and value to other disciplines such as history, geography, and paleo-environmental studies, providing such data are adequately disseminated. Such provisions have been accommodated in the highway program for 1975 by providing a budget for the publication of research results, including the Environmental Impact Statement. The utility and relevance of the GRD will also be examined on the basis of testing procedures in the specific projects and perhaps over a period of time the GRD will become subdivided into more specialized areas, subtended under each of the four major problem domains. This feedback relationship from specific field projects back to the GRD is provided for in Figure 1.

Without a doubt, new hypotheses and methods will be generated out of field studies in the mitigation phase projects. These discoveries should be exploited to their fullest by letting them have input into

future studies of the same locality; and allowing them to refine questions and procedures of other regions. Because of the more intensive nature of mitigation phase sampling, primarily due to excavations, such a phase is most critical to the rigorous testing of hypotheses generated previous to, and during, final field studies. It will be at this stage where we begin to derive some conception of the relevance or appropriateness of theoretical considerations present in both the GRD and SRD. It is potentially as important to know what doesn't work as well as what does.

SUMMARY

This paper has attempted to deal with problems basic to small-scale contract situations and to propose a general approach toward providing methodological and theoretical continuity to research. Contract archeology in the highway context was discussed in terms of regional sampling liabilities as well as several positive features that should be exploited when doing highway related archeology. The general goal of behavioral reconstruction for individual sites was justified in terms of limitations in regional sampling, although this objective was qualified by suggesting that regionally based patterns of cultural systems can be elucidated by highway transects and partially confirmed as well. Toward satisfying the goal of single-site activity reconstruction four problem domains were listed which, when considered in concert, should help in these reconstructions. The flow of research from the conducting of Environmental Impact Statement studies through final stage mitigation was outlined. The contribution of one stage to others in light of the General Research Design was discussed. The General Research Design is viewed primarily as a preliminary attempt to theoretically and methodologically organize highway research and as a vehicle for the derivation of topical and regional designs and testable models. Thus the main function of the General Research Design is not so much one of theory using, although certainly at a general level theory is exerting some influence on the conduct of research; rather, the design is seen as a means of systematically and explicitly generating theory.

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INSTITUTE ACTIVITIES

Charleston Meetings

During January the activities of the entire staff of the Institute were devoted largely to the hosting of the annual meetings of the Society for Historical Archaeology and the International Conference on Underwater Archaeology. These meetings were held on January 7-11, 1975 at the Mills Hyatt House in Charleston, South Carolina. There was excellent attendance with 556 registrants from 46 states, the District of Columbia, seven provinces of Canada, and from England, Honduras, Wales, Belgium, Australia, Netherlands, and Mexico. The accommodations provided by the Mills Hyatt House were outstanding and the decor was appropriate to the general theme of the meetings, "The Spirit of 1775".

Scholarly sessions included symposia of invited participants as well as topically organized sessions of contributed papers. The theme of the scholarly session was "Archeological Science through the Material Remains of Culture". In the S.H.A. sessions 62 people presented 77 papers. In the I.C.U.A. sessions 35 people presented 42 papers. A special session was held on Saturday, January 11th on "Underwater Archeology and the Law", aimed at amateur-professional cooperation. There were also tours of several historic archeological sites in the Charleston vicinity.

The remainder of January was spent in cleaning up and resting up from two years of effort to make these meetings the success that they proved to be. The Institute also entertained numerous guests, the week after the meetings, who had stayed over to study some special aspect of the Institute's work or merely to visit and see the Institute.

Publications

At the Charleston meetings, the Institute launched its major monograph publication series. This is the Anthropological Studies, Occasional Papers of the Institute of Archeology and Anthropology, University of South Carolina. The first of this series, Anthropological Studies, No. 1, is the report by Stanley South of the archeological research done by the Institute at Fort Moultrie National Monument for the National Park Service. This volume is entitled "Palmetto Parapets" and is available from the Institute for \$5.00 per copy. Other manuscripts are in preparation for additional monographs in this series.

This is the fifth series of publications being done by the Institute. Others are:

1. The Notebook. This is a bi-monthly bulletin of scholarly papers and reports of activities of the Institute. Papers published are of less than 25 pages (usually) and pertain to the archeology and other aspects of anthropology in South Carolina and related areas. It is edited by Robert L. Stephenson and is distributed to those interested.

2. Research Manuscript Series. This is a limited edition series of reports of research activities of the Institute. It is not available for general distribution but copies are on file at the State Library, South Carolina Department of Archives and History, National Park Service, and other similar repositories. Many of the items in this series are subsequently published in The Notebook and elsewhere. There have been 66 reports published in this series.

3. The Conference on Historic Site Archaeology Papers. This is the annual publication of papers of the Conference on Historic Site Archaeology. It contains, in addition to the Conference papers an "Historical Archaeology Forum" and a few especially pertinent contributed papers. It is edited by Stanley South and is now in its seventh volume. It is available from the Institute at \$8.00 per volume.

4. Historical Archaeology. The Journal of the Society for Historical Archaeology is an annual publication of journal type articles. It is edited by John D. Combes and is in its ninth volume. It is available by membership in the Society for Historical Archaeology at \$7.50 per year. Applications for membership may be sent to the Institute.

Holocene Seminar

The Institute participated in seminar series with the University of South Carolina's Department of Geology beginning in January and to continue through May, 1975. This seminar is led by Dr. Don C. Colquhoun of the Department of Geology. It is an interdisciplinary approach to a study of the Pleistocene-Holocene boundary on the South Atlantic seaboard. Of primary concern is the nature of the apparent sea-level fluctuations in relation to climate, topography, soils, vegetation, animal life, and cultural remains as these relate to the Holocene Period and the demarkation of the Pleistocene-Holocene boundary.

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